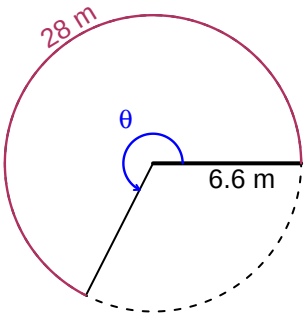
Name: Date:

Trig Final (SLTN v680)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 6.6 meters. The arc length is 28 meters. What is the angle measure in radians?

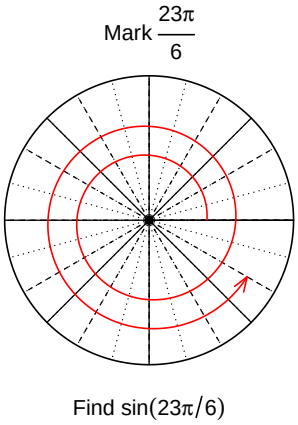


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

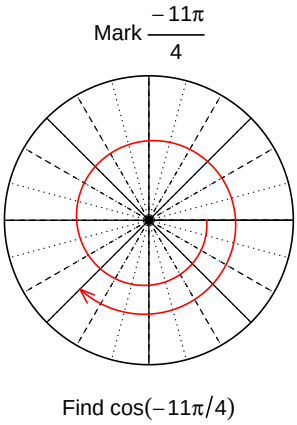
$\theta = 4.242$ radians.

Question 2

Consider angles $\frac{23\pi}{6}$ and $\frac{-11\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{23\pi}{6}\right)$ and $\cos\left(\frac{-11\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\sin(23\pi/6)$



Find $\cos(-11\pi/4)$

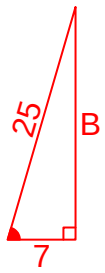
$\sin(23\pi/6) = \frac{-1}{2}$

$\cos(-11\pi/4) = \frac{-\sqrt{2}}{2}$

Question 3

If $\cos(\theta) = \frac{-7}{25}$, and θ is in quadrant II, determine an exact value for $\tan(\theta)$.

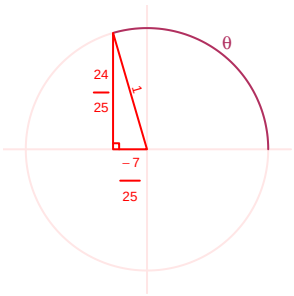
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$7^2 + B^2 = 25^2$$
$$B = \sqrt{25^2 - 7^2}$$
$$B = 24$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\tan(\theta) = \frac{\frac{24}{25}}{\frac{-7}{25}} = \frac{-24}{7}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = -4.01$ meters, a frequency of 8.72 Hz, and an amplitude of 6.39 meters. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 6.39\sin(2\pi 8.72t) - 4.01$$

or

$$y = 6.39\sin(17.44\pi t) - 4.01$$

or

$$y = 6.39\sin(54.79t) - 4.01$$